* NOTICES *

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3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention is used for flyback type switching power supply, and relates to suitable.switching power supply.
[0002]
[Description of the Prior Art]In the conventional flyback type switching power supply, full wave rectification of the output of AC power supply is carried out by the diode bridge circuit etc., for example, it is smoothed by a capacitor etc., and is supplied to the primary coil of a transformer via switching elements, such as a transistor. In such a device, it corresponds to the time which the transistor turns on, or the cycle which a transistor turns on and off, Since current will flow into the secondary coil of a transformer if the cycle through which current flows into time for current to flow into the primary coil of a transformer or the primary coil of a transformer changes, respectively, Smooth rectification of this current is carried out, for example by the diode or a capacitor, and it is supplied to the load connected to the secondary coil of a transformer.
[0003]In this case, in order to make into predetermined value V_{C1} voltage built over the load connected to the secondary coil of a transformer in the conventional device, For example, ON/OFF of a transistor is controlled so that the voltage corresponding to the voltage in the secondary coil concerning a secondary coil and the 3rd coil provided in the like pole becomes predetermined value V_{C2} to a transformer.
[0004]
[Problem(s) to be Solved by the Invention]By the way, in such a device, if a heavy load is connected to a secondary coil, for example, a high current will flow, and the voltage in a secondary coil will fall, but since the load in the 3rd coil is constant, the voltage does not change. Therefore, ON/OFF control of the transistor was not carried out so that the voltage in

the secondary coil which fell in this case might be raised.

[0005]Then, the current (drawing 5 (a)) in a primary coil fluctuated corresponding to the current which flows into a secondary coil is detected, and there is the method of amending the voltage in the 3rd coil based on the peak hold value (drawing 5 (b)) of this current. That is, there is the method of amending the voltage in the 3rd coil so that it may become the voltage corresponding to the voltage in a secondary coil which falls when a heavy load is connected to a secondary coil and a high current flows.

[0006]However, in order to raise the power-factor of a device in this method, for example, When the capacitor which performs smoothing after full wave rectification of the output of AC power supply was carried out is removed, the current which flows into a primary coil, Since it changes on frequency (commercial frequency) twice the frequency of AC power supply having as the output (drawing 6) of AC power supply by which full wave rectification was carried out becomes what was switched with the transistor and it is shown in drawing 7, The voltage in the 3rd coil was not amended properly, but the technical problem where the voltage in a secondary coil is not stabilized occurred.

[0007]This invention is made in view of such a situation, and raises the stability of output voltage.

[0008]

[Means for Solving the Problem]This invention is characterized by switching power supply comprising the following.

The full wave rectifier circuit 3 as a rectification means which rectifies an output of AC power supply 1.

The field effect transistor (FET) 8 as a switching means which switches current rectified by the full wave rectifier circuit 3.

The transformer 4 as a coupling means which sends current through secondary coil L_2 and 3rd coil L_3 when current switched by FET8 flows into primary coil L_1.

Diode D_2 as a voltage detection means which detects voltage corresponding to voltage in secondary coil L_2 of the transformer 4 from 3rd coil L_3 provided in the transformer 4, Capacitor C_1, resistance R_2, and R_3, Current transformer L_4 as a current detecting means which detects current which flows into primary coil L_1 of the transformer 4, The detector circuit 5 as a peak voltage detection means to detect voltage corresponding to a peak value of current detected by current transformer L_4, The correction circuit 6 as a compensation means which amends voltage detected by diode D_2, capacitor C_1, resistance R_2, and R_3 corresponding to voltage detected by the detector circuit 5, PWM controlling circuit 7 as a control means which controls FET8 corresponding to voltage amended by the correction circuit 6.

[0009]
[Function]In the switching power supply of the above-mentioned composition, the current to which full wave rectification of the output of AC power supply 1 was carried out by the full wave rectifier circuit 3 is switched, and current flows into secondary coil L_2 by flowing into primary coil L_1 of the transformer 4. . On the other hand, generate in 3rd coil L_3 provided in the transformer 4. The voltage corresponding to the voltage in secondary coil L_2 is amended by the voltage corresponding to the peak value of the current which flows into primary coil L_1, and FET8 is controlled based on the voltage corresponding to the voltage in this amended secondary coil L_2. Therefore, the voltage in secondary coil L_2 can be stabilized.

[0010]
[Example]Drawing 1 is a circuit diagram showing the composition of one example of the flyback type switching power supply adapting the switching power supply of this invention. AC power supply 1 supplies the voltage (current) which has commercial frequency, such as 50 Hz or 60 Hz, for example to the line noise filter 2. The line noise filter 2 removes the noise which has been in the voltage (current) supplied from AC power supply 1, and outputs it to the full wave rectifier circuit 3. The full wave rectifier circuit 3 comprises a diode bridge circuit (not shown), for example, and carries out full wave rectification of the voltage (current) supplied via the line noise filter 2 from AC power supply 1.
[0011]Primary coil L_1 of the transformer 4 is connected to the full wave rectifier circuit 3 via the drain and sauce of the field effect transistor (FET) 8. FET8, the drain is connected to the end of primary coil L_1 of the transformer 4, and the sauce is connected to the end of the full wave rectifier circuit 3, respectively.
The gate is connected to PWM controlling circuit 7.
FET8 is turned on and off from PWM controlling circuit 7 corresponding to the driving pulse supplied to the gate, and it controls the current which flows into primary coil L_1.
[0012]Secondary coil L_2 of the transformer 4 is connected to capacitor C_2 for current smooth via diode D_3. Diode D_3 is a diode for rectifying the current which flows into secondary coil L_2 of the transformer 4, the anode is connected to the end of secondary coil L_2 of the transformer 4, and the cathode is connected to the end of capacitor C_2. The both ends of capacitor C_2 are connected to the load 9 of a television receiver etc., respectively.
[0013]As for current transformer L_4, the one end is connected to the anode of diode D_1, and the other end is connected to resistance R_1.

There, the current corresponding to the current to which the current outputted from the full wave rectifier circuit 3 was switched by FET8 flows.
The cathode of diode D_1 is connected to the end of the direction which is not connected with current transformer L_4 of resistance R_1.
The node of diode D_1 and resistance R_1 is connected to PWM controlling circuit 7.

[0014]The voltage corresponding to the current which carried out rectification smoothing of the current into which the detector circuit 5 flows through the node of current transformer L_4 and diode D_1, That is, the voltage corresponding to the peak value of the current which flows through the node of current transformer L_4 and diode D_1 is detected, and the correction circuit 6 is supplied.
[0015]As for 3rd coil L_3 of the transformer 4, the one end is connected to the anode of diode D_2, and the other end is grounded.
The same polar voltage as secondary coil L_2 is generated.
That is, 3rd coil L_3 generates the voltage corresponding to the voltage concerning the load 9 connected to secondary coil L_2, i.e., the voltage concerning capacitor C_2. As for capacitor C_1, the one end is connected to the cathode of diode D_2, and the other end is grounded. The end of the direction which resistance R_2 and R_3 are connected in series, and is not connected with resistance R_3 of resistance R_2, The end of the direction which is connected at the node of diode D_2 and capacitor C_1, and is not connected with resistance R_2 of resistance R_3 is grounded. The node of resistance R_2 and resistance R_3 is connected to the correction circuit 6. Therefore, the series circuit which consists of resistance R_2 and R_3 carries out the partial pressure of the voltage in the node of diode D_2 and capacitor C_1, and supplies it to the correction circuit 6.
[0016]The correction circuit 6 receives the input of the voltage corresponding to the peak value of the current which flows through the node of current transformer L_4 and diode D_1, i.e., the voltage corresponding to the peak value of the current which flows through the primary coil of the transformer 4, from the detector circuit 5. And the voltage generated in 3rd coil L_3 based on this voltage, A peak hold is carried out by diode D_2 and capacitor C_1, The voltage by which the partial pressure was carried out by resistance R_2 and R_3 is amended on the voltage

corresponding to the voltage concerning capacitor C_2 (load 9) connected to secondary coil L_2 via diode D_3, and is outputted to PWM controlling circuit 7.

[0017]As for resistance R_4, the one end is connected at the node of the full wave rectifier circuit 3 and primary coil L_1, and the other end is connected to PWM controlling circuit 7. The output voltage of the full wave rectifier circuit 3 is supplied to PWM controlling circuit 7.

[0018]The voltage to which PWM controlling circuit 7 is supplied from the full wave rectifier circuit 3 via resistance R_4, And the voltage in the node of diode D_1 and resistance R_1, That is, from the voltage concerning primary coil L_1, and the voltage corresponding to the current which flows into primary coil L_1, the driving pulse of an ON/OFF sake is outputted for the current which flows into primary coil L_1 to the gate of FET8 so that the power-factor of a device may be improved most. PWM controlling circuit 7 so that voltage supplied from the correction circuit 6 may be made into a predetermined value, That is, the driving pulse of an ON/OFF sake is outputted for the current which flows into primary coil L_1 to the gate of FET8 so that voltage concerning capacitor C_2 connected to secondary coil L_2 and parallel via diode D_3 may be made into the rated voltage value of the load 9.

[0019]Next, the operation is explained. If a device is started, while the driving pulse for starting will be impressed to the gate of FET8 from PWM controlling circuit 7, For example, the output of AC power supply 1 which has commercial frequency, such as 50 Hz or 60 Hz, is supplied to the full wave rectifier circuit 3 via the line noise filter 2, and full wave rectification is carried out in the full wave rectifier circuit 3.

[0020]In FET8, according to the cycle and pulse width of a driving pulse for starting which are impressed to the gate from PWM controlling circuit 7, If between the drain and sauce is turned on and off, the current (drawing 2) by which full wave rectification was carried out will flow through primary coil L_1 of the transformer 4 in the full wave rectifier circuit 3 corresponding to switching of FET8 (drawing 3). (if switched)

[0021]Simultaneously, while the output voltage from the full wave rectifier circuit 3 is supplied to PWM controlling circuit 7 via resistance R_4, The output current from the full wave rectifier circuit 3 (drawing 3), i.e., the current which flows through primary coil L_1, is detected by current transformer L_4, it flows through diode D_1 and resistance R_1, is transformed into voltage by resistance R_1, and is supplied to PWM controlling circuit 7. That is, the output voltage from the full wave rectifier circuit 3 and the voltage corresponding to the output current from the full wave rectifier circuit 3 are supplied to PWM controlling circuit 7.

[0022]In PWM controlling circuit 7, the driving pulse for sending current through primary coil L_1 from the output voltage from the full wave rectifier circuit 3 and the voltage corresponding to output current, so that the power-factor of a device may be improved most is impressed to the gate of FET8.

[0023]When FET8 is an ON state, the current by which full wave rectification was carried out in the full wave rectifier circuit 3 flows through primary coil L_1, and magnetic flux occurs in the transformer 4. If FET8 will be in an OFF state, the magnetic flux through which current would not flow into primary coil L_1 and which was generated in the transformer 4 will begin to decrease, but voltage (back electromotive force) occurs in secondary coil L_2 and 3rd coil L_3 so that change (reduction) of this magnetic flux may be opposed.

[0024]The current corresponding to the voltage (back electromotive force) generated in secondary coil L_2 flows into capacitor C_2 via diode D_3, The voltage corresponding to the electric charge which the electric charge was charged by capacitor C_2 and charged by capacitor C_2 is impressed to the load 9.

[0025]On the other hand, the current corresponding to the voltage (back electromotive force) generated in 3rd coil L_3 flows into capacitor C_1 via diode D_2, The voltage corresponding to the electric charge which the electric charge was charged by capacitor C_2 and charged by capacitor C_2 is impressed to the end of the direction which is not connected with resistance R_3 of resistance R_2.

[0026]Here, since 3rd coil L_3 has the same polarity as secondary coil L_2 as mentioned above, the voltage corresponding to the voltage which secondary coil L_2 generated, i.e., the voltage impressed to the load 9, (voltage of the both ends of capacitor C_2) occurs to the both ends of the 3rd coil. Therefore, the voltage corresponding to the voltage (voltage of the both ends of capacitor C_2) impressed to the load 9 is impressed to the end of the direction which is not connected with resistance R_3 of the node of capacitor C_1 and diode D_2, i.e., resistance R_2.

[0027]The voltage corresponding to the voltage (voltage of the both ends of capacitor C_2) impressed to the load 9 impressed to the end of the direction which is not connected with resistance R_3 of resistance R_2, In the series circuit which consists of resistance R_2 and R_3, a partial pressure is carried out to the rated input voltage of the correction circuit 6, and the correction circuit 6 is supplied.

[0028]Here, when the load 9 is a heavy load (device with heavy load), for example, much current flows into the load 9 and the voltage (voltage concerning the load 9) of the both ends of

capacitor C_2 descends. However, since the load (impedance seen from 3rd coil L_3) in 3rd coil L_3 is constant, Voltage higher than the voltage corresponding to the voltage (voltage concerning the load 9) of the both ends of capacitor C_2 which descends when much current flows into the load 9 occurs in 3rd coil L_3.

[0029]Then, the voltage (drawing 4) corresponding to the current which flows into secondary coil L_2 is detected from the current (drawing 3) which flows into primary coil L_1 detected by current transformer L_4 in the detector circuit 5. Namely, the current in secondary coil L_2 (primary coil L_1), Since it flows so that it may be proportional to the current which flows into primary coil L_1 (secondary coil L_2), In the detector circuit 5, the peak hold of the current (drawing 3) which flows into primary coil L_1 detected by current transformer L_4 is carried out by a capacitor with large capacity to build in (not shown) (drawing 4), and it is supplied to the correction circuit 6.

[0030]The current which flows into primary coil L_1 detected by current transformer L_4 here, Since full wave rectification of the output of AC power supply 1 is carried out in the full wave rectifier circuit 3 (drawing 2) and it is switched by FET8, as shown in drawing 3, it has commercial frequency twice the frequency of the output of AC power supply 1 having. For this reason, as mentioned above, in the detector circuit 5. The peak hold (smoothing) of the current which flows into primary coil L_1 detected by current transformer L_4 by a capacitor with large capacity to build in is carried out (drawing 4), and the influence of commercial frequency twice the frequency of in this current is reduced.

[0031]In the correction circuit 6, the voltage the partial pressure was carried out [voltage] by resistance R_2 and R_3 is amended by the voltage supplied from the detector circuit 5, and is supplied to PWM controlling circuit 7. Namely, [higher than the voltage corresponding to the voltage (voltage concerning the load 9) of the both ends of capacitor C_2 which descends in the correction circuit 6 when much current flows into the load 9] The voltage in 3rd coil L_3 with the voltage corresponding to the current which flows into primary coil L_1 proportional to the current in secondary coil L_2. It is amended by the voltage corresponding to the voltage (voltage concerning the load 9) of the both ends of capacitor C_2 which descends when much current flows into the load 9, and PWM controlling circuit 7 is supplied.

[0032]In PWM controlling circuit 7, the voltage supplied from the correction circuit 6 so that it may become a predetermined value, That is, the current which flows into primary coil L_1 is impressed to the driving pulse of an ON/OFF sake at the gate of FET8 so that voltage

concerning capacitor C_2 connected to secondary coil L_2 via diode D_3 may be made into the rated voltage value of the load 9.

[0033]In FET8, the current which flows into primary coil L_1 is turned on and off according to the driving pulse impressed to the gate from PWM controlling circuit 7.

[0034]. Thus, in the correction circuit 6, generate in 3rd coil L_3. In [the voltage corresponding to the voltage in secondary coil L_2 is amended by the voltage which reduced the influence of commercial frequency twice the frequency of the current which flows into primary coil L_1 having, and] PWM controlling circuit 7, FET8 is controlled so that the voltage corresponding to the voltage in this amended secondary coil L_2 becomes a predetermined value. Therefore, the voltage in secondary coil L_2 can be stabilized.

[0035]

[Effect of the Invention]As mentioned above, according to the switching power supply of this invention, the current with which the output of AC power supply was rectified by the rectification means is switched, and current flows into a secondary coil and the 3rd coil by flowing into the primary coil of a coupling means. The voltage corresponding to the voltage in a secondary coil generated on the other hand in the 3rd coil provided in the coupling means, Since it is amended by the voltage corresponding to the peak value of the current which flows into a primary coil and a switching means is controlled based on the voltage corresponding to the voltage in this amended secondary coil, the output voltage of a secondary coil can be stabilized.

[Translation done.]

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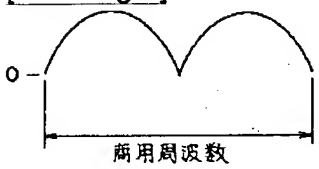
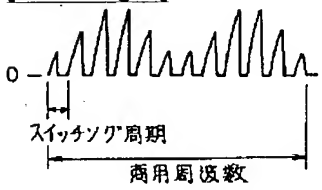
DRAWINGS

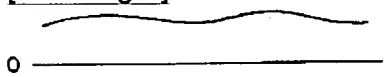
[Drawing 2]



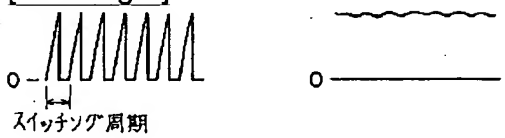
[Drawing 3]



[Drawing 4]

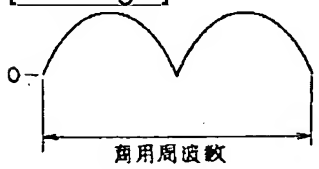


[Drawing 5]

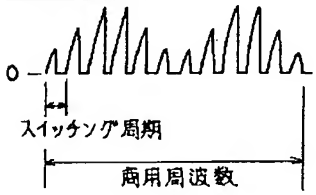


(a) (b)

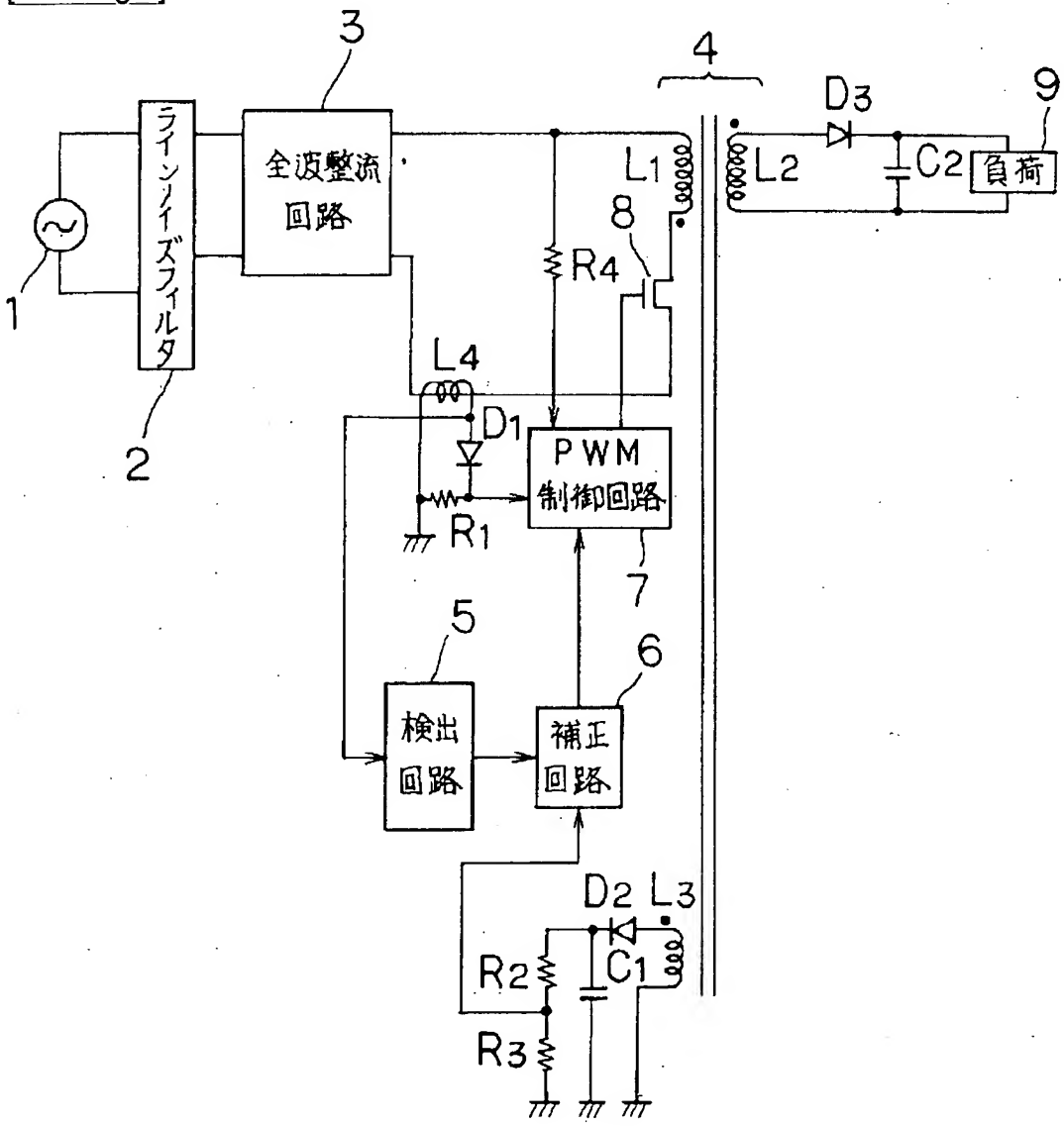
[Drawing 6]



[Drawing 7]



[Drawing 1]



[Translation done.]